

THE HAEMATOZOA OF AUSTRALIAN BIRDS.—NO. 3.

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The present paper is a continuation of the systematic examination for haematozoa of blood slides from Australian birds, of which two previous numbers have already been contributed by Dr. T. Harvey Johnston, in association with the present writer. The present paper deals with the examination of further slides up to the end of 1914. The majority of the birds were obtained in New South Wales, but some came from South Australia, Queensland, and the islands of Bass Straits.

I would here like to express my gratitude to Dr. T. L. Bancroft, of Eidsvold, Queensland, who has so generously forwarded many blood-films for examination, as well as to my former colleague, Dr. T. Harvey Johnston, with whom some of the earlier specimens in this paper were conjointly examined.

The haematozoa found in Australian birds are comprised in the protozoan genera *Halteridium*, *Plasmodium*, *Trypanosoma*, and *Leucocytozoon* (?), whilst *Microfilariae* have also been found.

Our joint and separate researches have now shown the presence of *Halteridia* in birds in all the States of the Commonwealth, except Victoria, from which latter State we have as yet had no opportunity of examining specimens. The genus *Plasmodium* has been found in sparrows in Sydney, and has been recorded from Victoria by Gilruth, Sweet, and Dodd, and from Queensland by Breinl. We have met with trypanosomes in Queensland birds, and in two instances in birds from New South Wales, one of these cases being from Grafton and the other from near Sydney. Trypanosomes seem rarer in birds in New South Wales than in those from Queensland. *Leucocytozoon* (?), which we have thought may possibly be an intracorpuseular stage of a trypanosome, has been found chiefly in

(1) "The Haematozoa of Australian Birds, No. 1," by J. Burton Cleland, M.D., Ch.M., and T. Harvey Johnston, M.A., D.Sc., appeared in *Trans. Roy. Soc., S.A.*, vol. xxxiv., 1910. "The Haematozoa of Australian Birds, No. 2," by the same authors, appeared in the *Jour. and Proc. Roy. Soc., N.S.W.*, vol. xlv., 1911.

Queensland birds. In the present paper, however, an instance of infection in a spiny-cheeked honey-eater as far south in New South Wales as Yanco is recorded. We have detected *Microflariae* in birds from Queensland and New South Wales.

In this paper, as in previous papers, a list of birds, whose bloods have yielded negative results in our hands when microscopically examined, is given.

We have now examined 160 species of Australian birds, comprising 339 individuals, for haematozoa with negative results. In the list of species in this paper giving the negative results I have indicated those species from which we had previously obtained haematozoa. We have now detected the presence of *Halteridia* in 32 species of Australian birds: 11 of these are mentioned in the present paper, the host in six instances being new. We have met with the genus *Plasmodium* in several sparrows captured in the neighbourhood of Sydney. A parasite of the black swan, forwarded to us by Dr. Bancroft, of Queensland, contains a large intracellular parasite, which we have provisionally placed in the genus *Plasmodium*, though possibly it should be referred to *Halteridium*. These parasites are in general oval, but occasionally show a tendency to assume a halter form. No schizonts were detected to enable the matter to be settled. We have found the presence of trypanosomes in eight species, three of which are referred to in the present paper, two of them being new hosts, though in one of these two we had previously found *Leucocytozoa*. *Leucocytozoa* have been detected in ten species, of which four are included here, two being new hosts. In five species trypanosomes and *Leucocytozoa* have both been detected, in three species trypanosomes alone, and in five species *Leucocytozoa* alone.

From these figures it will be seen that trypanosomes and *Leucocytozoa* are often present in the same species of bird, and even in the same individual bird. This fact may be due merely to the coincidence that the one invertebrate host will serve for the transmission of both parasites to the avian host. On the other hand, it may indicate what we have suggested in previous papers—*viz.*, that the *Leucocytozoon* is an intracellular phase of the trypanosome. At present it seems advisable to record the intracellular bodies as separate parasites, though in our previous papers they were included under the heading "Trypanosomes." Parasites of this nature are known from other parts of the world, and are generally considered as in no way related to trypanosomes.

The following list indicates those species harbouring one or both of these blood parasites, and the number of individuals in which they have been found:—

	<i>Trypanosomes.</i>	<i>Leucocytozoa.</i>	Both.
<i>Podargus strigoides</i>	—	1	—
<i>Microeca fasciatus</i>	1	—	—
<i>Pardalotus melanocephalus</i>	1	—	—
<i>Myzomela sanguineolenta</i> ...	—	3	1
<i>Ptilotis fusca</i>	1	5	5
<i>Ptilotis chrysops</i>	1	—	—
<i>Myzantha garrula</i>	—	4	—
<i>Anellobia chrysoptera</i>	—	—	2
<i>Acanthogenys rufigularis</i> ...	—	1	—
<i>Entomyza cyanotis</i>	—	—	3
<i>Oriolus sagittarius</i>	—	2	1
<i>Sphecotheres maxillaris</i> ...	—	2	—
<i>Corcorax melanorhampus</i> ...	—	2	—
	—	—	—
Total individuals affected	4	20	12
Total species affected ...	3	5	5

Microfilariae have been found in 26 species of birds, of which six are included in the present paper, one host being new.

I.—PLASMODIUM.

(1) *Plasmodium biziuræ* (?) from *Chenopsis atrata* (Black Swan).—A large intra-corpuscular parasite of the black swan, for the slide containing which I am indebted to Dr. Bancroft, has the general appearance of a *Plasmodium*. The parasites appear as rounded or irregularly oval bodies, often at one end of the host cell, displacing the nucleus. Sometimes the parasites are oval and lying alongside the host-nucleus, occasionally they are bean-shaped, and in one or two instances they tended to curl round the host-nucleus after the fashion of *Halteridium*. There were no marked halter-forms, however, and their absence, coupled with the displacement of the host-nucleus, suggest that the parasite is a *Plasmodium*, and not a *Halteridium*. No schizonts were detected to set the matter at rest. The parasites showed an alveolar appearance of the protoplasm, some (male forms) staining a paler blue than others (female). Melanin appeared as fine scattered granules (about 20 small grains in one male form), as fine granules grouped at one side in another male form, as scattered coarser granules also in a male form, or as two large coarse masses in the centre in a female form. Some of the infected corpuscles were partly dehaemoglobinized. Even in a small pale spherical form of 7 μ diameter, the nucleus was displaced. One of the largest parasites, which assumed a slight halter form, measured 14 \times 5 μ , the host-cell containing it 15.8 \times 8.2 μ . Descriptions of other examples of the parasites, which were few in number, are as follow:—

- (1) Oval, deep blue, 9 \times 5.5 μ , placed alongside the host-nucleus, and displacing it, corpuscle partly dehaemoglobinized.

- (2) Placed obliquely at one end of the corpuscle, 8 to 10 μ long, coarse masses of melanin.
- (3) Elongated oval, $12 \times 5.2 \mu$, placed alongside the host-nucleus, scattered fine grains of pigment.
- (4) Oval, tending to curl round the ends of the host-nucleus, 13.8μ long.

These parasites are much larger than the *Plasmodium* we have found in sparrows in Sydney. They are also larger than the *Halteridia* we have met with. Gilruth, Sweet, and Dodd (Proc. Roy. Soc., Vic., xxiii., n.s. p. 231) have recorded *P. biziuræ* from the musk-duck, *Biziura lobata*. This latter species is 8.5 to 10×4.8 to 9.7μ , displaces the host-nucleus, and causes slight enlargement of the infected cells from 13.5 to 14.2×7.8 to 8.5μ , to 15.6×9.7 to 10.6μ . As the musk-duck inhabits the same localities as the black swan, it seems possible, in spite of slight differences in size and shape, that our parasite (if a true *Plasmodium*, and not a *Halteridium*) is also *P. biziuræ*, under which designation it is provisionally placed.

(2) *Plasmodium passeris*, from *Passer domesticus* (House Sparrow).—In the Proceedings of the Linnean Society of New South Wales, in 1909, vol. xxxiv., p. 505, Dr. Johnston and myself have recorded the presence of a malarial parasite in sparrows in Sydney. Another instance of infection has been met with, a few red cells in one of two sparrows obtained in October, 1914, showing spherical forms of about 4.8μ diameter at one end of the host-cell, displacing its nucleus. There were a few fine scattered grains of pigment. It is of interest to note that so far no indigenous species of birds in the neighbourhood of Sydney has shown an infestation by a *Plasmodium*, whilst this parasite, presumably imported into Australia with its present host, must have existed in Sydney for at least half a century, and probably for longer (no sparrows have been introduced into Australia of recent years). Notwithstanding apparently ample opportunities for transmission to other birds, this seems not to have been achieved, either because the parasite is specific to its passerine host, or because the invertebrate host has opportunities of biting sparrows much more frequently than other birds. An intermediate host like the mosquito, *Culex fatigans*, would fulfil this latter rôle, since it confines its activities to the immediate neighbourhood of houses to which few native birds resort.

II.—HALTERIDIUM.

There are several additional infected species to be recorded, as well as further records of species already shown to be infected:—

(1) *Halteridium* of *Catheturus lathamii*.—A further specimen obtained by Dr. Bancroft at Eidsvold, Queensland, in December, 1911, has been found infected.

(2) *Halteridium* of *Ninox boobook*.—In our first joint paper we recorded the presence of *Halteridium* in *Ninox boobook* (?) from Queensland. Another blood-slide from this species, forwarded by Dr. Bancroft in September, 1911, from Eidsvold, also showed their presence.

(3) *Halteridium* of *Ninox strenua*.—*Halteridia*, very few in number, were seen in slides made from this bird, and kindly given to us in February, 1913, by Dr. Bancroft from Eidsvold.

(4) *Halteridium* of *Gerygone albigularis*.—Blood-slides were obtained from a specimen of this species shot at Molong in 1913. *Halteridia* of large size were present, occupying the side and both ends of the host-cell, in some instances distinctly but slightly displacing the nucleus. In some instances five-sixths of the available space in the red cell was occupied by the *Halteridium*. Occasionally the side of the host-cell opposite the parasite was reduced to a mere rim of protoplasm. The pigment was coarse.

(5) *Halteridium* of *Dicaeum hirundinaceum* (Swallow Dicaeum).—*Halteridia* were detected in a specimen of *Dicaeum* obtained on the Hawkesbury River, near Sydney, in March, 1912. The parasite occupied the side and both ends of the containing red cell. Pigment was moderately abundant, the individual grains being of medium size. Pale forms were not noticed.

(6) *Halteridium* of *Pardalotus melanocephalus* (Black-headed Pardalote).—Dr. Johnston and I have previously recorded the presence of *Halteridia* in this species. Dr. Bancroft forwarded from Eidsvold in October, 1911, a further film from this bird showing a few *Halteridia*.

(7) *Halteridium* of *Melithreptus validirostris* (Thick-billed Honey-eater).—A blood-film was obtained from this species on Flinders Island, in Bass Straits, at the end of November, 1912. *Halteridia* were present, but scarce. Both pale- and dark-staining forms were noticed. A remarkable feature was the scarcity of pigment, even in adult forms extending from end to end of their host-cells. In these just a few minute grains or none at all were detected. Possibly this is a specific feature.

(8) *Halteridium* of *Myzomela sanguinolenta* (Sanguineous Honey-eater).—We have previously recorded *Halteridia* from this species. Another infected specimen was forwarded by Dr. Bancroft from Eidsvold in October, 1911, infested also with *Microfilariae*, trypanosomes, and *Leucocytozoa*. The *Halteridia* were numerous, with one or a few large grains of

pigment, and surrounded the host-nucleus, leaving only a thin rim of protoplasm externally.

(9) *Halteridium* of *Ptilotis chrysops*.—In a blood-slide made from one of these birds, shot at Milson Island, in the Hawkesbury River, in November, 1914, numerous *Halteridia* and a few trypanosomes were detected. The *Halteridia*, which we have previously recorded from this species, presented no special features, occupying one side and most of both ends of the affected host-cells, and showing coarse grains of pigment, collected into groups, sometimes at one end only, sometimes at both ends, and sometimes in the middle.

(10) *Halteridium* of *Ptilotis penicillata*.—In a specimen of this honey-eater, obtained at Overland Corner, Murray River, South Australia, a few *Halteridia* were detected, some mature, some half-grown. Pigment was present as large granules.

(11) *Halteridium* of *Acanthogenys ruficularis* (Spiny-cheeked Honey-eater).—A few *Halteridia* have been detected in blood-films from one of these birds obtained at Cobar in October, 1911, and in another shot at Merrool, near Yanco, in October, 1912. In the latter case, *Leucocytozoa* were also present.

III.—LEUCOCYTOZOA (“Intra-corpuseular Trypanosomes(?)”).

In No. II. of our Haematozoa of Australian Birds, Dr. Johnston and myself have described intra-corpuseular bodies in the blood corpuscles of various Australian birds. We have thought that these might be intra-corpuseular forms of the trypanosomes with which they are often associated, and have referred to them as such, or as *Leucocytozoa*. These rounded parasites seem not uncommon in birds in other parts of the world, and are usually referred to as “*Leucocytozoa*,” a term which it seems preferable to use rather than a more or less committal one, such as “intra-corpuseular trypanosomes.” All the specimens we have so far examined from various birds are of spherical form and seem specifically indistinguishable. The following specimens have been examined since our last paper:—

(1) *Leucocytozoon* of *Podargus strigoides*.—In 1913 Dr. Bancroft sent us slides from this *Podargus* from Eidsvold, Queensland. *Microfilariae* were present, and in addition moderately numerous male and female forms of a *Leucocytozoon*, measuring 8·5 to 10·5 μ in diameter. We have not previously recorded *Leucocytozoon* from this species of bird.

(2) *Leucocytozoon* of *Myzomela sanguinolenta*.—An additional bird, obtained by Dr. Bancroft in October, 1911, has been found infected with *Leucocytozoon*, as well as with trypanosomes, *Microfilariae*, and *Halteridia*.

(3) *Leucocytozoon* of *Ptilotis fusca*.—We have previously recorded “free and intra-corpuscular trypanosomes” from Queensland birds of this species. In a bird shot near Grafton, New South Wales, in April, 1912, both trypanosomes and *Leucocytozoa* were detected. This was the first New South Wales bird in which either of these parasites had been found.

(4) *Leucocytozoon* of *Acanthogenys ruficularis* (Spiny-cheeked Honey-eater).—In a bird shot at Merrool, near Yanco, in October, 1912, these *Leucocytozoa* were detected. In young forms the host-nucleus was bayed by the parasite, in older forms it lay as a cap or a band on the parasite. The colouration of the host-nucleus by Giemsa’s stain in infected cells was more purplish than in the case of non-parasitized cells, the tint being the same as is obtained when a red corpuscle has been partly injured in making a film. In some of the largest forms the protoplasm of the parasites contained a few dark granules. The infection of this bird is of considerable interest. The locality is in the south of New South Wales, not very far from the Victorian border, the only other bird in this State that we have so far found infested with the *Leucocytozoon* having come from the opposite, north-east, corner—*viz.*, Grafton. The bird is also more of an interior, dry-loving species, whereas Grafton is sub-tropical.

IV.—TRYPANOSOMES.

One new infected Australian species of bird has been met with since our last report. The species of trypanosome is probably the same as that found in other Australian species and called by us *Trypanosoma anellobiae*:—

(1) Trypanosome of *Myzomela sanguinolenta* (Sanguineous Honey-eater).—We have previously recorded the presence of *Leucocytozoa* (“Intra-corpuscular Trypanosomes”) in this species from Eidsvold, Queensland. In October, 1911, Dr. Bancroft kindly forwarded another specimen from the same locality, in which a few trypanosomes, as well as *Leucocytozoa*, *Halteridia*, and *Microfilariae* were detected. The posterior end of the only uninjured trypanosome seen was finely attenuated with the micro-nucleus $12\ \mu$ from the extremity. The micro-nucleus, $2.5\ \mu$ long, was $11\ \mu$ anteriorly, the body at this level being $5\ \mu$ wide. From the macro-nucleus the parasite gradually tapered anteriorly to end at $26\ \mu$. There was a broad, undulating membrane. This is another instance of the association of *Leucocytozoa* and trypanosomes.

(2) Trypanosome of *Ptilotis fusca*.—We have previously recorded *Leucocytozoon* and trypanosomes from Queensland specimens of this bird. The bird shot at Grafton in April, 1912, referred to under *Leucocytozoon*, also contained trypanosomes.

(3) Trypanosome of *Ptilotis chrysops*.—In a bird shot at Milson Island, Hawkesbury River, in November, 1914, numerous *Halteridia* were present, and a single well-preserved trypanosome was seen, as well as several degenerated forms without flagella. This parasite was dark blue, with a pointed posterior end with the micro-nucleus close to the tip. The body was about $17\ \mu$ long, apart from the curves, which would make it about $20\ \mu$, the free flagellum was $12\ \mu$ long, and the greatest breadth $3\cdot5\ \mu$. A search for *Leucocytozoa* did not reveal any.

V.—MICROFILARIAE.

(1 and 2) *Microfilariae* of *Plotus novae-hollandiae* and *Phalacrocorax sulcirostris*.—In October, 1911, we received from Dr. Bancroft at Eidsvold, Queensland, blood smears from these two species of birds. My former colleague, Dr. T. Harvey Johnston, was with Dr. Bancroft when the birds were shot, and describes the two species as commingling together. Dr. Johnston has recorded our findings in a paper read before the Royal Society of Queensland in June, 1912. An examination of these slides shows the presence of sheathed *Microfilariae* specifically different from the unsheathed forms previously recorded by us from *Phalacrocorax melanoleucus* in our second paper. The *Microfilariae* showed a well-marked sheath, either as an empty envelope extending beyond one end of the worm, or as a long empty tube left trailing behind as the *Microfilariae* "wriggled" forwards in the drying blood smear. The anterior ends of the bodies were rounded, and the posterior ends rapidly attenuated to a sharp point, this feature being somewhat obscured by the sheath. There was indistinct cross-striation. The anterior end showed a clear area from a few up to $7\ \mu$ in length, being sometimes mostly occupied by isolated nuclear masses, at others possessing only a small mass. The following are the measurements, in micromillimetres, of several individuals from both species:—

	From <i>P. sulcirostris</i> .		From <i>Plotus</i> .			
Anterior clear area ...	Nuclei occupy most of the specimen	7	5	7	4	
Anterior end to 1st "spot"	43	40	35	43	36	38 34
1st "spot" (incomplete) ...	2	2	2	2	2	
1st "spot" to 2nd "spot"	15·5	15·5	14	17	17	17
2nd "spot" (V-shaped) ...	3·5	3·5	3·5	3·5		
2nd "spot" to end ...	95	104	95	112·5		
Total length ...	159	165	154·5	185	181	173
Breadth ...		5	5·5	5·5	7	7

(3) *Microfilaria* of *Podargus strigoides*.—In our second paper we have referred to the *Microfilaria* of this species of frogmouth. In a further specimen, also forwarded to us from Eidsvold, Queensland, by Dr. Bancroft, these parasites were very numerous, and *Leucocytozoa* were also present. The *Microfilariae* showed fine transverse striations, and the tail tapered to a sharp point, whilst the anterior end was blunt. In our previous paper we gave the total length as 90 to 100 μ , but an examination of this bird shows they may reach nearly 140 μ . The following are the measurements, in micromillimetres, of several individuals:—Total lengths, 98, 100·3, 105·4, 131·5, 137·4, 138; anterior "clear" area, 3·4 to 5·5; anterior end to first "spot," 29·5, 27·5, 29·5, 31, 38, 39·5; length of first "spot," 2 to 3·4; from first "spot" to second "spot," 26, 24, 26, 24, 38, 29·5; length of second "spot," 2 to 5 μ , in one instance, perhaps due to injury, 7 μ ; from second "spot" to posterior end, 38, 43·5, 43, 52 (with a doubtful third "spot" in the exact middle of this area), 51, 44 (with a third "spot" 27 μ from the anterior end of this area). The greatest diameter was 3·5 to 4 μ . Microscopically, though the measurements vary in individuals and seem to group themselves about two means, there is nothing to suggest that more than one species is present.

(4) *Microfilaria* of *Eurystomus pacificus*.—Another specimen of the roller infested with *Microfilariae* was forwarded by Dr. Bancroft from Queensland in January, 1912.

(5) *Microfilaria* of *Collyriocichla harmonica*.—*Microfilariae* were detected in the blood of a specimen of the harmonious thrush obtained at the Hawkesbury River, New South Wales, in June, 1912. Their features may be summarized as follows:—Anterior end, blunt; breadth throughout more or less uniform, though the posterior third diminishes slightly; posterior end also blunt; fine cross-striations; a very short "clear" area at the anterior end. Total length, 96 to 103 μ ; anterior "clear" area, sometimes 2·5 μ long; first "spot," 20·5 μ from anterior end in three specimens, and 26 μ in a fourth; a V-shaped "break" at about 36 to 38 μ from the anterior end; a third "spot" at 57 to 62 μ from the anterior end; greatest breadth, 3·5 μ .

(6) *Microfilaria* of *Myzomela sanguinolenta*.—Another specimen of the sanguineous honey-eater infested with the exceedingly long *Microfilaria* mentioned in our second paper, and also harbouring *Halteridia*, *Leucocytozoa*, and trypanosomes, was kindly forwarded in October, 1911, from Eidsvold by Dr. Bancroft.

The following are the tabulated lists of the material examined for the purpose of this paper. The numbers (M. 216, etc.) refer to Mathews' "Hand-list of the Birds of Australasia," published in *The Emu* (vol. vii., 1907-8).

I.—LIST OF BIRDS IN WHICH *Plasmodia* WERE FOUND.

- Chenopsis atrata* (M. 216), Eidsvold, Queensland, 1914 (1 with *Plasmodium*, 1 *nil*).
Passer domesticus (introduced), Sydney, October, 1914 (1 with *Plasmodium*, 1 *nil*).

2.—LIST OF BIRDS IN WHICH *Halteridia* WERE FOUND.

- Catheturus lathamii* (M. 7), Eidsvold, Queensland, December, 1911.
Ninox boobook (M. 283), Eidsvold, September, 1911; Eidsvold, January, 1913 (*nil*); Mannum, South Australia, November, 1913 (*nil*).
Ninox strenua (M. 291), Eidsvold, February, 1913.
Gerygone albigularis (M. 451), Molong, October, 1913.
Dicaeum hirundinaceum (M. 722), Hawkesbury River, March, 1912.
Pardalotus melanocephalus (M. 729), Eidsvold, October, 1911.
Melithreptus validirostris (M. 740), Flinders Island, Bass Straits, November, 1912.
Myzomela sanguinolenta (M. 746), Eidsvold, October, 1911 (with *Microfilariae*, trypanosomes, and *Leucocytozoa*).
Ptilotis chrysops (M. 775), Hawkesbury River, November, 1914 (with trypanosomes).
Ptilotis penicillata (M. 791), Overland Corner, River Murray, South Australia, December, 1913 (1 with *Halteridia*, 1 *nil*).
Acanthogenys ruficularis (M. 812), Cobar, September, 1911; Yanco, October, 1912 (with *Leucocytozoa*).

3.—LIST OF BIRDS IN WHICH *Leucocytozoa* WERE FOUND.

- Podargus strigoides* (M. 376), Eidsvold, 1913 (with *Microfilariae*); Hawkesbury River (*nil*).
Myzomela sanguinolenta (M. 746), Eidsvold, October, 1911 (with trypanosomes, *Halteridia*, and *Microfilariae*).
Ptilotis fusca (M. 769), Grafton, April, 1912 (with trypanosomes); Wellington, New South Wales, October, 1914 (*nil*).
Acanthogenys ruficularis (M. 812). Cobar, September, 1911 (*Halteridia* only); Yanco, October, 1912 (with *Halteridia* also).

4.—LIST OF BIRDS IN WHICH TRYPANOSOMES WERE FOUND.

- Myzomela sanguinolenta* (M. 746), Eidsvold, Queensland, October, 1911 (with *Leucocytozoa*, *Halteridia*, and *Microfilariae*).
- Ptilotis fusca* (M. 769), Grafton, April, 1912 (with *Leucocytozoa*); Wellington, New South Wales, October, 1914 (*nil*).
- Ptilotis chrysops* (M. 775), Hawkesbury River, November, 1914 (with *Halteridia*).

5.—LIST OF BIRDS IN WHICH *Microfilariae* WERE FOUND.

- Phalacrocorax sulcirostris* (M. 238), Eidsvold, October, 1911.
- Plotus novae-hollandiae* (M. 242), Queensland, October, 1911.
- Podargus strigoides* (M. 376), Eidsvold, 1913 (with *Leucocytozoa*); Hawkesbury River (*nil*).
- Eurystomus pacificus* (M. 381), Eidsvold, January, 1912.
- Collyriocichla harmonica* (M. 636), Hawkesbury River, June, 1912; Eidsvold, April, 1913, (*nil*).
- Myzomela sanguinolenta* (M. 746), Eidsvold, October, 1911 (with *Halteridia*, trypanosomes, and *Leucocytozoa*).

6.—LIST OF BIRDS IN WHICH HAEMATOOZA WERE NOT FOUND.

- (The figure (1) placed before a bird's name indicates that we have on previous occasions found *Halteridia* in the species, (2) a trypanosome, (3) *Leucocytozoon*, and (4) a *Microfilaria*).
- Dromaeus novae-hollandiae* (M 1), Eidsvold, Queensland, September, 1913.
- Geopelia humeralis* (M. 33), Gular, October, 1911.
- Geopelia placida* (M. 34), Gular, October, 1911.
- Chalcophaps chrysochlora* (M. 36), Eidsvold, September, 1913.
- Phaps chalcoptera* (M. 37), Eidsvold, Queensland, April, 1913.
- Podiceps novae-hollandiae* (M. 65), Hawkesbury River, October, 1911.
- Pelagodroma marina* (M. 75), Flinders Island, Bass Straits, November, 1912.
- Puffinus tenuirostris* (M. 84), Flinders Island, November, 1912.
- Diomedea exulans* (M. 109), South of Tasmania, 1914.
- Haematopus fuliginosus* (M. 145), Flinders Island, November, 1912.
- Aegialitis melanops* (M. 158), Eidsvold, September, 1911.
- Heteropygia aurita* (M. 181), Gular, October, 1911 (2); Flinders Island, Bass Straits, November, 1912 (2).
- Notophox novae-hollandiae* (M. 204), Eidsvold, October, 1911.
- Notophox pacifica* (M. 205), Gular, October, 1911.
- Phalacrocorax carbo* (M. 237), Queensland, October, 1911 (2).
- Phalacrocorax*, sp., Hawkesbury River.

- Uroaëtus audax* (M. 262), Eidsvold, February, 1913.
Falco melanotus, Flinders Island, November, 1912.
Hieracidea berigora (M. 278), Eidsvold, January, 1912.
 Hawk sp., Eidsvold, January, 1912 (2).
 Large owl, Eidsvold, 1913.
Glossopsittacus pusillus (M. 309), Hawkesbury River, July, 1912.
Cacatua galerita (M. 320), Eidsvold, September, 1911 (2).
Polytelis barrabandi (M. 328), Cobar, September, 1911.
Aprosmictus cyanopygius (M. 332), Eidsvold, January, 1912.
Platycercus eximius (M. 343), Eidsvold, January, 1912.
Barnardius barnardi (M. 349), Willbriggie, October, 1912.
Psephotus haematorrhous (M. 354), Dubbo, September, 1911.
Psephotus haematonotus (M. 361), Cowra, September, 1911.
Halcyon sordidus (M. 394), Queensland, October, 1911.
Eurostopus albigularis (M. 397), Eidsvold, January, 1912.
Scythrops novae-hollandiae (M. 416), Eidsvold, January, 1912.
Chelidon ariel (M. 432), Gular, October, 1911; Morgan, South Australia, November, 1913 (2).
 (2) *Microeca fascinans* (M. 433), Morgan, November, 1913.
Petroeca rosea (M. 443), Hawkesbury River, June, 1912.
Smicrornis brevirostris (M. 449), Cobar, September, 1911; Hawkesbury River, June, 1912.
Myiagra rubecula (M. 488), Hawkesbury River, 1912.
Coracina robusta (M. 504), Queensland, October, 1911.
Coracina parvirostris (M. 505), Flinders Island, November, 1912.
Cinclosoma castanonotum (M. 516), Alawoona, South Australia, December, 1913.
Drymaoedus brunneopygius (M. 521), Alawoona, December, 1913.
Pomatorhinus ruficeps (M. 531), Cobar, September, 1911 (young bird).
Ephthianura tricolor (M. 547), Molong, October, 1913.
Origma rubricata (M. 557), Sydney, May, 1912.
Chthonicola sagittata (M. 558), The Oaks, June, 1914.
Acanthiza nana (M. 559), Sydney, November, 1911.
Acanthiza diemenensis (M. 565), Flinders Island, November, 1912.
Acanthiza pyrrhopygia (M. 568), Monarto South, South Australia, July, 1914; Willbriggie, New South Wales, October, 1912.
Acanthiza uropygialis (M. 573), Dubbo, September, 1911 (2).
Acanthiza reguloides (M. 575), Dubbo, September, 1911.
Sericornis flindersi, Flinders Island, November, 1912.
Malurus cyaneus (M. 592), Flinders Island, November, 1912.
Malurus melanotus (M. 595), Overland Corner, South Australia, December, 1913.

- Artamus superciliosus* (M. 625), Cowra, September, 1911.
Artamus tenebrosus (M. 634), Hawkesbury River, October, 1912.
Collyriocichla rectirostris (M. 637), Flinders Island, November, 1912.
 (1) *Grallina picata* (M. 646), Cowra, September, 1911.
Pachycephala rufiventris (M. 674), Yanco, October, 1912; Eidsvold, August, 1913.
 (1) *Aphelocephala leucopsis* (M. 689), Narrabri, February, 1912; Gular, October, 1911.
 (1) *Zosterops coerulescens* (M. 712), Ourimbah, November, 1911; Flinders Island, November, 1912.
Pardalotus ornatus (M. 723), Gular, October, 1911; Alawoona, South Australia, December, 1913.
Pardalotus affinis (M. 725), Flinders Island, November, 1912.
Pardalotus punctatus (M. 726), Hawkesbury River, March, 1912.
Pardalotus xanthopygius (M. 727), Mannum, South Australia, November, 1913.
 (1) *Melithreptus atricapillus* (M. 733), Sydney, November, 1911; Hawkesbury River, June, 1912.
Melithreptus brevirostris (M. 741), Hawkesbury River, June, 1912; Mannum, South Australia, November, 1913.
Melithreptus affinis (M. 744), Flinders Island, November, 1912.
Ptilotis flavicollis (M. 776), Flinders Island, November, 1912 (2).
Ptilotis leucotis (M. 778), Hawkesbury River, June, 1912.
Ptilotis melanops (M. 781), Hawkesbury River, June, 1912.
Ptilotis ornata (M. 786), Murray River, South Australia, November, 1913; Alawoona, South Australia, December, 1913; Monarto South, South Australia, July, 1914.
Meliornis sericea (M. 801), Sydney.
 (1, 3) *Myzantha garrula* (M. 804), Hawkesbury River, May, 1912.
 (1, 2, 3, 4) *Oriolus sagittarius* (M. 850), Eidsvold, June, 1911.
Chibia bracteata (M. 854), Eidsvold, February, 1913.
 (4) *Corvus coronoides* (M. 872), Hawkesbury River, September, 1911.
Strepera, Eidsvold, September, 1913.
 (4) *Struthidea cinerea* (M. 882), Eidsvold, April, 1913 (2)
 (3, 4) *Corcorax melanorhampus* (M. 883), Hawkesbury River, May, 1912.

INTRODUCED BIRD.

Turtur suratensis, Indian Dove, Sydley, December, 1911.